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EXAMINER	
MEUCCI, MICHAEL D	
ART UNIT	**PAPER NUMBER**
2142	

DATE MAILED: 06/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/773,839	WEERAHANDI ET AL.	
	Examiner	Art Unit	
	Michael D. Meucci	2142	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 January 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 February 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7, 5 AC

Claim ~~1-20~~ rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Correction is necessary on the following:

Claim 7 recites the limitation "the minimum delay for each packet size" in line 2. There is insufficient antecedent basis for this limitation in the claim. Examiner suggests: --a minimum delay for each packet size-- in this instance to overcome the lack of antecedent basis.

Response to Amendment

2. Examiner acknowledges amendments made to overcome all claim objections and 35 U.S.C. § 112 rejections except as noted in this office action.

3. The amendment to the specification does not comply with 37 CFR 1.121 because it does not use underlining and strikethrough to show changes in the specification. Applicant is required to resubmit the amendment to the specification in proper format (See 37 CFR 1.121 (b)(1)).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 1-2, 8-11, and 17 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas (U.S. 6,201,791 B1) in view of Ramanathan et al. (U.S. 6,076,113) hereinafter referred to as Ramanathan.

a. As per claim 1, Bournas discloses generating a plurality of data packets (lines 13-15 of column 6); sending data packets to first node (lines 34-36 of column 5); sending data packets to second node (lines 39-40 of column 5); receiving response message from nodes at remote host (lines 38-39 of column 5); generating delay times for packets to reach the nodes based on the received response messages (item 508 of FIG 5 and 602 of FIG. 6); and estimating the bandwidth based on delay times (lines 34-55 of column 7, and items 614-618 of FIG. 6).

Bournas does not explicitly teach: sending data packets from the remote host to the first and second nodes. However, Ramanathan discloses: "The throughput measurement system 100 evaluates subscriber perceived network performance between the IS 10 and the subscriber sites 12, 14, and 16 and test target 42. These sites can be referred to as target sites. As will be described in more detail below, the throughput measurement system 100 emulates data

transfers over TCP using the User Datagram Protocol (UDP) and Internet Control Message Protocol (ICMP) to transmit and receive packets, respectively, from the target sites 12, 14, 16, and 42, and calculates data transfer throughput to the target sites 12, 14, 16 and 42 with a restriction on the TCP window size. Data transfer throughput is the rate at which the system transfers data to and from the target sites 12, 14, 16 and 42," (lines 29-41 of column 5).

It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to have the remote host send data packets to the first and second node. "This thus allows the throughput measurement system 100 to actively test the target sites 12, 14, 16, and 42 without flooding the interconnect network 34 with test packets," (lines 10-13 of column 6 in Ramanathan). It is for this reason that one of ordinary skill in the art at the time of the applicant's invention would have been motivated to have the remote host send data packets to the first and second nodes in the system as taught by Bournas.

b. As per claim 2, Bournas discloses generating estimate indicative of the total packet-size independent delay between first and second nodes (abstract); and generating estimate indicative of the delay per byte between first and second nodes using a robust estimation method (lines 34-45 of column 2).

c. As per claims 8-10, Bournas discloses data packets as ICMP-Echo request, TCP, and UDP data packets (lines 47-49 of column 3). ICMP, TCP, and UDP are all included in the TCP/IP suite.

d. As per claim 11, Bournas teaches generating a plurality of data packets (lines 13-15 of column 6); sending data packets to first node (lines 34-36

of column 5); sending data packets to second node (lines 39-40 of column 5); receiving response message from nodes indicating receipt of data packets (lines 38-39 of column 5); generating delay times for packets to reach the nodes based on the received response messages (item 508 of FIG 5 and 602 of FIG. 6); estimating the bandwidth based on delay times (lines 34-55 of column 7, and items 614-618 of FIG. 6); and estimating the average available bandwidth over a short period of time (lines 59-62 of column 2).

Bournas does not explicitly teach: sending data packets from the remote host to the first and second nodes. However, Ramanathan discloses: "The throughput measurement system 100 evaluates subscriber perceived network performance between the IS 10 and the subscriber sites 12, 14, and 16 and test target 42. These sites can be referred to as target sites. As will be described in more detail below, the throughput measurement system 100 emulates data transfers over TCP using the User Datagram Protocol (UDP) and Internet Control Message Protocol (ICMP) to transmit and receive packets, respectively, from the target sites 12, 14, 16, and 42, and calculates data transfer throughput to the target sites 12, 14, 16 and 42 with a restriction on the TCP window size. Data transfer throughput is the rate at which the system transfers data to and from the target sites 12, 14, 16 and 42," (lines 29-41 of column 5).

It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to have the remote host send data packets to the first and second node. "This thus allows the throughput measurement system 100 to actively test the target sites 12, 14, 16, and 42 without flooding the interconnect

network 34 with test packets," (lines 10-13 of column 6 in Ramanathan). It is for this reason that one of ordinary skill in the art at the time of the applicant's invention would have been motivated to have the remote host send data packets to the first and second nodes in the system as taught by Bournas.

e. As per claim 17, Bournas discloses generating a plurality of data packets (lines 13-15 of column 6); sending data packets to first node (lines 34-36 of column 5); sending data packets to second node (lines 39-40 of column 5); receiving response message from nodes at remote host (lines 38-39 of column 5); generating delay times for packets to reach the nodes based on the received response messages (item 508 of FIG 5 and 602 of FIG. 6); and estimating the bandwidth based on delay times (lines 34-55 of column 7, and items 614-618 of FIG. 6).

Bournas does not explicitly teach: sending data packets from the remote host to the first and second nodes. However, Ramanathan discloses: "The throughput measurement system 100 evaluates subscriber perceived network performance between the IS 10 and the subscriber sites 12, 14, and 16 and test target 42. These sites can be referred to as target sites. As will be described in more detail below, the throughput measurement system 100 emulates data transfers over TCP using the User Datagram Protocol (UDP) and Internet Control Message Protocol (ICMP) to transmit and receive packets, respectively, from the target sites 12, 14, 16, and 42, and calculates data transfer throughput to the target sites 12, 14, 16 and 42 with a restriction on the TCP window size. Data

transfer throughput is the rate at which the system transfers data to and from the target sites 12, 14, 16 and 42," (lines 29-41 of column 5).

It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to have the remote host send data packets to the first and second node. "This thus allows the throughput measurement system 100 to actively test the target sites 12, 14, 16, and 42 without flooding the interconnect network 34 with test packets," (lines 10-13 of column 6 in Ramanathan). It is for this reason that one of ordinary skill in the art at the time of the applicant's invention would have been motivated to have the remote host send data packets to the first and second nodes in the system as taught by Bournas.

It is inherent that the system of Bournas includes memory for storing an operating system and the bandwidth estimator program; a processor for communication between memory, operating system and bandwidth estimator program; and a network interface for sending and receiving data to and from nodes in communication network.

6. Claim 3 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas and Ramanathan as applied to claim 2 above, in view of Kratz et al. (Fault detection for time-delay systems by data reconciliation) hereinafter referred to as Kratz.

Bournas does not teach estimating according to a robust estimation method such as the least trimmed squares method. However, Kratz discloses

using input estimation and basing the method on the concept of standardized least square residuals (Abstract of Kratz).

One of ordinary skill in the art at the time of the applicant's invention would have clearly recognized that it is quite advantageous for the system of Bournas to estimate according to an estimation method such as the least trimmed squares method in a time-delay system. The least trimmed squares method is a well known formula and shows proven consistency. It is for this reason that one of ordinary skill in the art would have been motivated to use a robust estimation method such as the least trimmed squares method in the system of Bournas.

7. Claim 4 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas and Ramanathan as applied to claim 2 above, in view of Malakoff (Bayes Offers 'New' Way to Make Sense of Numbers).

Bournas fails to teach estimating based on Bayesian analysis assuming that the first estimate is correct. However, Malakoff discloses: "The new tools (computers) made the Bayesian approach accessible to a wide range of users, who say it has significant advantages. One is that it allows researchers to plug in prior knowledge, whereas frequentist approaches require users to blind themselves to existing information because it might bias the results," (lines 5-7 of page 3 in Malakoff).

One of ordinary skill in the art at the time of the applicant's invention would have clearly recognized that it is quite advantageous for the system of Bournas to estimate based on Bayesian analysis assuming the first estimate is correct.

Bayesian analysis has been well known for over 200 years and can be very helpful to researchers trying to discern patterns in massive data sets or in problems where many variables may be influencing an observed result (lines 8-9 of page 3 in Malakoff). It is for this reason that one of ordinary skill in the art would have been motivated to estimate based on Bayesian analysis assuming the first estimate is correct.

8. Claims 5 and 6 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas and Malakoff as applied to claim 4 above, in view of Huberman et al. (U.S. 6,115,718) hereinafter referred to as Huberman.

Bournas fails to teach the Bayesian point analysis further assuming a right-skewed distribution such as the inverse Gaussian delay distribution. However, Huberman discloses: "it has been determined that the probability distribution of first passage times to a threshold is given asymptotically by the two parameter inverse Gaussian distribution [EQUATION] (for EQUATION, refer to column 6, equation (2) in Huberman) with mean and variance (lines 7-16 of column 6 in Huberman and FIG. 3).

One of ordinary skill in the art at the time of the applicant's invention would have clearly recognized that it is quite advantageous for the system of Bournas to assume a right-skewed distribution such as the inverse Gaussian delay distribution. The inverse Gaussian distribution derived from the law of surfing enables the construction of predictive models of traffic at Web sites (lines 39-41 of column 8 in Huberman). It is for this reason that one of ordinary skill in the art

would have been motivated to assume a right-skewed distribution such as the inverse Gaussian delay distribution.

9. Claim 7 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas and Ramanathan as applied to claim 1 and in view of McKee et al (U.S. 5,477,531) hereinafter referred to as McKee.

Bournas teaches data packet pairs are sent more than once to nodes (lines 13-15 of column 6 in Bournas).

Bournas fail to teach delay times based on the minimum delay for each packet size. However, McKee discloses: "the sub-routine derives a minimum and mean round trip time and these values are graphically displayed against packet size on the output device," (lines 30-34 of column 7 in McKee).

One of ordinary skill in the art at the time of the applicant's invention would have clearly recognized that it is quite advantageous for the system of Bournas to base the delay times on the minimum delay for each packet size. The minimum round-trip time delays for the various packet sizes provide an indication of the average queuing delay for each size of packet. It is for this reason that one of ordinary skill in the art would have been motivated to base the delay times on the minimum delay for each packet size.

10. Claim 12 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas and Ramanathan as applied to claim 11 above, in view of Barber (U.S.

6,285,972 B1) and Kahkoska et al. (U.S. 6,002,671) hereinafter referred to as Kahkoska.

Bournas does not teach sending K data sets from a traffic generator or estimating according to nonlinear regression.

However, Kahkoska and Barber disclose the constraints respectively:

Kahkoska discloses: "generating traffic through the downstream data channel at a specified data rate according to a remote traffic generator protocol," (lines 19-21 of column 6 in Kahkoska).

Barber discloses: "calculation of nonlinear regression models is well known in the art (lines 9-10 of column 8 in Barber).

One of ordinary skill in the art at the time of the applicant's invention would have clearly recognized that it is quite advantageous for the system of Bournas to send K data sets from a traffic generator. The method may be modified to test any combination of upstream and downstream data rates in order to obtain a measure of throughput according to specific requirements (lines 60-64 of column 5 in Kahkoska). It is for this reason that one of ordinary skill in the art would have been motivated to send K data sets from a traffic generator as taught by Kahkoska.

One of ordinary skill in the art at the time of the applicant's invention would have clearly recognized that it is quite advantageous for the system of Bournas to estimate according to nonlinear regression. For instance, software programs can be used to calculate a neural network based on the random drive and response of the system (lines 11-14 of column 8 in Barber), based on nonlinear

regression models. It is for this reason that one or ordinary skill in the art would have been motivated to estimate according to nonlinear regression as taught by Barber.

11. Claim 13 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas, Ramanathan, Kahkoska, and Barber as applied to claim 12 above, in view of Huberman as applied to claim 6 above.

Claim 14 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas and Ramanathan as applied to claim 11 above, in view of Official Notice.

Official Notice taken that both the concept and the advantages of calculating the available bandwidth using Bayesian point estimates and mean traffic rates are well known and expected in the art. It would have been obvious to calculate the available bandwidth using Bayesian point estimates and mean traffic rates because using mean traffic rates in a Bayesian point estimate would allow utilization of previous trials or “known data” in the calculation.

12. Claim 15 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas, Ramanathan and Official Notice as applied to claim 14 above, in view of, in further view of Huberman as applied to claim 6 above.

13. Claim 16 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas and Ramanathan as applied to claim 11 above, in view of Davies et al. (U.S. 6,483,805 B1) hereinafter referred to as Davies.

Bournas fails to teach traffic and router parameters being re-estimated upon changes in the network configuration or traffic conditions. However, Davies discloses: "Combining this information with the known statistical distribution of the data traffic relevant to the application creating the data, enables the router to form a statistical estimate of the current load on the network, and specifically the load on the next link in the network along which that data is transmitted" (lines 35-40 of column 8 in Davies).

One of ordinary skill in the art at the time of the applicant's invention would have clearly recognized that it is quite advantageous for the system of Bournas to re-estimate traffic and router characteristic parameters upon changes in the network configuration or traffic conditions. The router can then use this traffic information to limit the total number of transactions in progress (lines 43-44 of column 8 in Davies). It is for this reason that one of ordinary skill in the art would have been motivated to re-estimate traffic and router characteristic parameters upon changes in the network configuration or traffic conditions.

14. Claims 18 and 19 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas and Ramanathan as applied to claim 17 above, in view of Kahkoska.

Bournas teaches generating a plurality of data packets (lines 13-15 of column 6); sending data packets to first node (lines 34-36 of column 5); sending data packets to second node (lines 39-40 of column 5); receiving response message from nodes indicating receipt of data packets (lines 38-39 of column 5); generating delay times for packets to reach the nodes based on the received response messages (item 508 of FIG 5 and 602 of FIG. 6); estimating the bandwidth based on delay times (lines 34-55 of column 7, and items 614-618 of FIG. 6); and estimating the average available bandwidth over a short period of time (lines 59-62 of column 2).

Bournas fails to teach generating a known quantity of traffic at a location remote from host; and injecting said known quantity of traffic into the network. However, Kahkoska discloses: "sending of data traffic through the ADSL circuit at selected data rates according to a remote traffic generator protocol," (lines 18-20 of column 5 in Kahkoska).

One of ordinary skill in the art at the time of the applicant's invention would have clearly recognized that it is quite advantageous for the system of Bournas to generate a known quantity of traffic at a location remote from the host and injecting said known quantity of traffic into the network. The upstream and downstream data paths in the ADSL circuit, although operating according to the frequency division multiplexing scheme, may interact and interfere with each other to reduce the maximum available throughput. The throughput of the ADSL circuit therefore must be measured with traffic generated in both the upstream and downstream paths simultaneously in order to stress the ADSL circuit,

therefore requiring two test instruments that are working on each end of the ADSL circuit in tandem (lines 23-31 of column 2 in Kahkoska). It is for this reason that one of ordinary skill in the art would have been motivated to generate and insert traffic at a location remote from the host in the system as taught by Bournas and Ramanathan.

15. Claim 20 rejected under 35 U.S.C. 103(a) as being unpatentable over Bournas and Ramanathan as applied to claim 17 above, in view of Kahkoska.

Bournas fails to teach an input/output interface for communication with and end-user enabling them to estimate total and available bandwidth between two nodes in a communications network. However, Kahkoska discloses: "The remote test instrument sends the downstream data traffic and returns the results of the throughput test in the form of frame counts from its end of the ADSL circuit back to the test instrument at end of the test sequence. The results from the upstream and downstream throughput tests are then visually displayed to the user of the test instrument," (abstract of Kahkoska).

One of ordinary skill in the art at the time of the applicant's invention would have clearly recognized that it is quite advantageous for the system of Bournas to include and input/output interface to allow an end user to estimate bandwidth. It would be desirable to provide a test instrument capable of testing an circuit, operating in tandem with a remote test instrument at the opposite end of the circuit, to provide a measurement of the throughput of the circuit (lines 33-37 of column 1 in Kahkoska). It is for this reason that one or ordinary skill in the art

would have been motivated to include an input/output interface for communication with and end-user enabling them to estimate total and available bandwidth between two nodes in a communications network.

Response to Arguments

16. Applicant's arguments with respect to claim 1-20 have been considered but are moot in view of the new ground(s) of rejection. All arguments are directed towards subject matter disclosed in the independent claims. The grounds of rejection of the independent claims have changed making this action **non-final**.

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ramanathan et al. (U.S. 5,913,041) discloses system for determining data transfer rates according to log information.

Aharoni et al. (U.S. 6,014,694) discloses system for A/V transport over a network and bandwidth estimation based on statistical analysis.

Eager et al. (U.S. 6,868,452 B1) discloses bandwidth estimation in multicast systems.

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Meucci at (571) 272-3892. The examiner can normally be reached on Monday-Friday from 9:00 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Caldwell, can be reached at (571) 272-3868. The fax phone number for this Group is (703) 872-9306.

Communications via Internet e-mail regarding this application, other than those under 35 U.S.C. 132 or which otherwise require a signature, may be used by the applicant and should be addressed to [michael.meucci@uspto.gov].

All Internet e-mail communications will be made of record in the application file. PTO employees do not engage in Internet communications where there exists a possibility that sensitive information could be identified or exchanged unless the record includes a properly signed express waiver of the confidentiality requirements of 35 U.S.C. 122. This is more clearly set forth in the Interim Internet Usage Policy published in the Official Gazette of the Patent and Trademark on February 25, 1997 at 1195 OG 89.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Andrew Caldwell

ANDREW CALDWELL
SUPERVISORY PATENT EXAMINER